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United States Patent and Trademark Office

SINGLE KNOB MULTIFUNCTION CONTROLLER AND DISPLAY UNIT

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# SINGLE KNOB MULTIFUNCTION CONTROLLER AND DISPLAY UNIT

## FIELD OF INVENTION

The present invention relates generally to human-machine interfaces, and more particularly to such interfaces having a rotatable knob which is linearly translatable along  
5 the axis of rotation.

## BACKGROUND

Modern vehicles contain a number of systems which require input from the driver or its occupants. Examples of such systems include climate control, navigation, audio entertainment, video entertainment, and body control. As the number of systems increase  
10 and the functionality of each system increases, there is also an increasing demand for users of the systems to provide input. For example, climate control systems have evolved from needing a user to set a desired temperature for the entire passenger compartment to needing input for a desired temperature in each zone of the vehicle, such as the driver's area, front passenger's area, and the remaining area of the vehicle extending from behind  
15 the first seating row.

Using a conventional interface method of dedicated buttons and other control devices to provide input to each system requires that an undesirably large percentage of the vehicles interior surface be covered with these devices. Also, the large number of devices may become undesirably expensive to produce and challenging to assemble  
20 quickly and accurately.

## SUMMARY OF INVENTION

Accordingly, one aspect of the present invention is to provide a human-machine interface which is desirable for providing input to vehicle system.

Another aspect of the present invention is to provide a human-machine interface  
25 which may be economical to produce and assemble into a vehicle.

In accordance with these aspects, a human-machine interface device is provided  
for controlling a plurality of vehicle functions. The interface has a knob which is  
bidirectionally rotatable at a rest level and a pressed level. A selected one of the vehicle  
functions is selected by the knob at the rest level, and the selected one of the vehicle  
30 functions is controlled by the knob at the pressed level.

Further areas of applicability of the present invention will become apparent from the  
detailed description provided hereinafter. It should be understood however that the detailed  
description and specific examples, while indicating preferred embodiments of the invention,  
are intended for purposes of illustration only, since various changes and modifications  
35 within the spirit and scope of the invention will become apparent to those skilled in the art  
from this detailed description.

#### **BRIEF DESCRIPTION OF DRAWINGS**

Figure 1 illustrates a side view of a human-machine input device, and

Figure 2 illustrates a front view of a human-machine input device.

#### **DETAILED DESCRIPTION**

The following description of the preferred embodiments is merely exemplary in  
nature and is in no way intended to limit the invention, its application or uses.

Turning to Figure 1, a multifunction interface 1 is shown in side view. A housing  
10 contains an electronics assembly 34. A knob 12 is connected to the electronics  
45 assembly 32 by a shaft 14. The knob 12 is rotatable about the axis of shaft 14 and is also  
linearly translatable along the axis of shaft 14 to first and second positions as indicated by

bidirectional arrow 20. A connection 22 provides for communication between circuitry 32 and the system connected to interface 1. Additionally, an indicator 16, such as a lamp or LED, may be connected to the circuitry 32 via connection 34. One or more buttons 24  
50 may be located within the face of knob 12. A button 24 may include a button mounted indicator 18, such as a lamp or LED, which is connected to circuitry 32 via connection 36.

Turning now to Figure 2, a multifunction interface 1 is shown in front view. Knob 12 may be rotated clockwise and counterclockwise as indicated by bidirectional  
55 rotation arrow 38. Knob 12 may also be pressed, thereby translating it towards the housing 10. Knob 12 may also be rotated while it is pressed. Function annunciators 26a-e may be positioned on the housing 10, as may be a display 28. The display 28 may provide information regarding the vehicle system receiving input from the interface 1 by displaying a function label 30 and a function representation 40.

60 Operation of interface 1 will now be explained by non-limiting example. While interface 1 may be used to control one or more vehicle systems, climate control will be used in this example. Examples of systems include audio entertainment, video entertainment, and navigation.

Knob 12 rotates about an axis. Knob 12 may also be pressed from a rest level to a  
65 pressed level, where it is also rotatable. When pressed, knob 12 translates linearly down the axis of rotation from the rest level to the pressed level. When released, a bias element, such as a spring coaxial with shaft 14, urges knob 12 from the pressed level back to the rest level. Rotating knob 12 at the rest level selects the function that will be controlled. In climate control, these functions may include defrost, blower speed,

70 floor/vent mode, temperature, and automatic mode. Detents may be associated with each function such knob 12 may be rotated at the rest level and the detents may be sensed by a user to determine when the next function has been selected. Once the desired function is selected, knob 12 is depressed to the pressed level and then rotated to control the desired function. For example, if the temperature function was selected with knob 12 at the rest  
75 level, then the temperature may be adjusted by rotating knob 12 while it is depressed to the pressed position. The new desired temperature may then be accepted immediately by the climate control system, or the system may wait until knob 12 is released before accepting the new desired temperature.

If used, each function annunciator 26a-26e may be associated with a system  
80 function, i.e. defrost, blower speed, floor/vent mode, temperature, and automatic mode, respectively. As knob 12 is rotated at the rest level, each annunciator illuminates exclusive of the others to indicate which function is selected for control. For some functions, such as defrost, it is desirable to provide an indicator 16 to inform the user whether the selected function is on or off regardless of whether knob 12 is being rotated  
85 or pressed.

One or more buttons 24 may be located within the face of knob 12. A button 24 may be used to control a function which has an on/off operation, such as a rear window defroster and an air conditioning request. A button mounted indicator 18, such as a lamp or LED, may be used to indicate whether the function associated with a button 18 is  
90 turned on.

A display 28 may also be provided for indicating which function is selected by knob 12 at its rest level. The display may provide a function label 30 to indicate the

selected function. A function representation 40 may also be shown on the display to reflect adjustments made to the selected function while knob 12 is pressed and rotated.